Geomorphic Processes: Landforms and Landscapes
Prof. Javed N. Malik
Department of Earth Sciences
Indian Institute of Technology – Kanpur

Lecture – 20
Fluvial Processes and Related Landforms (Part VI)

Welcome back. So, in previous lecture we discussed about the drainage basin and how on what basis the drainage divide is been demarcated. So, this was the last slide.

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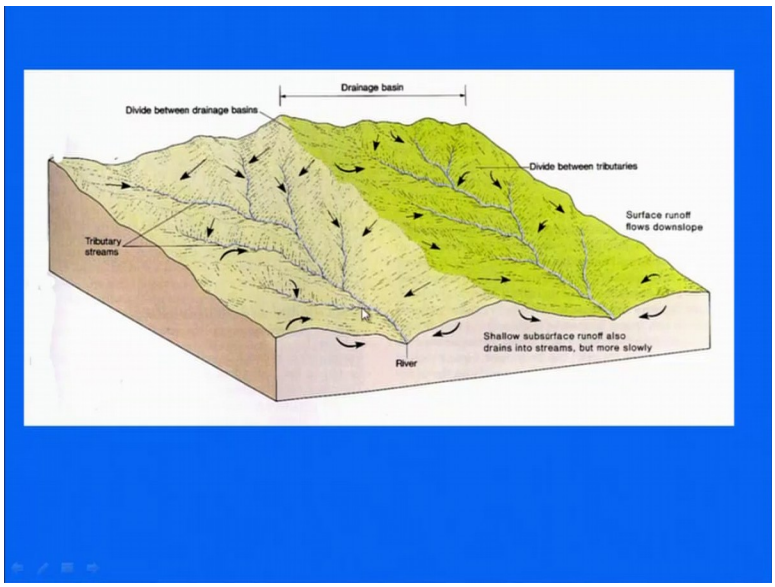

Which we discussed that we have drainage divide, which has marked along the line where you have the two drainages or the drainages of flowing in an opposite direction and feeding the transitive.

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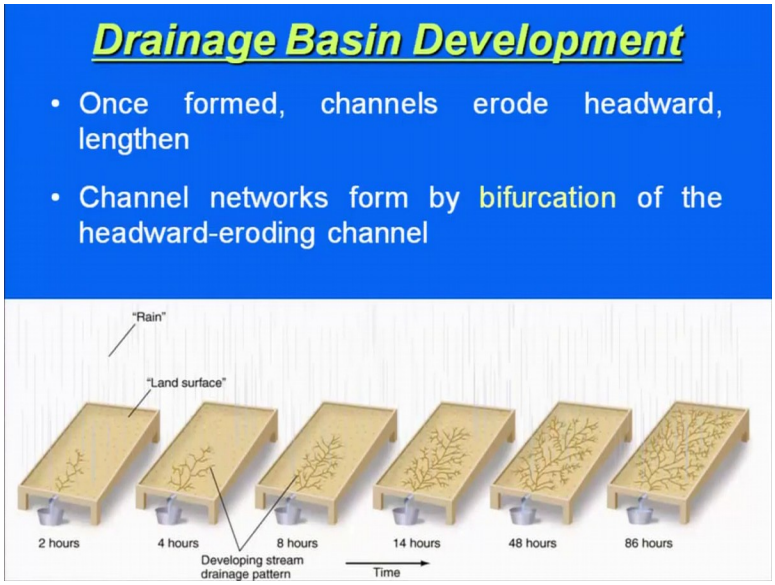

Now, moving further ahead this part from that already we have discuss that how the basin is formed basically. This is the experiment which shows that all the time that the same amount of precipitation from two hours to 86 hours on the same constant slope. Slowly the headwind erosion takes place and that will result into the evolution of the drainage basin. So, basically it erodes head ward and smaller stream joints.

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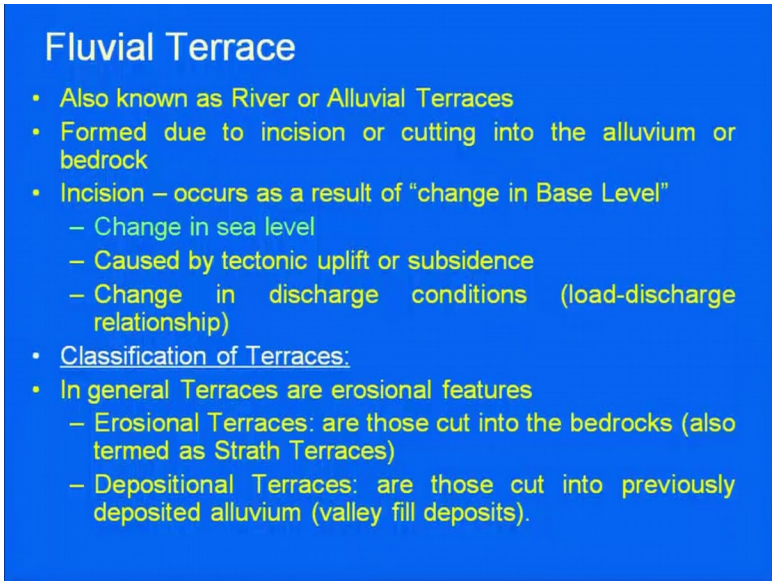

So, there is another very important land form as we have seen in contacts with the fluvial system. Like what we were talking about the point bars and trade bars and all that the fluvial terraces are usually seen all along the valley. So, all along the river valley this land form is very common. So, this land form is also termed as alluvial terraces and they are not only formed or seen in alluvial material.

But, also we can see the terraces which are formed in the bedrock. So, basically, this is due to incision or the position which result into the formation of terrace like feature or it is not step like feature and high ground which can which forms and alluvial or in bedrock. So, form due to incision or cutting into the alluvial or bedrock incision can occur as a result of Change in base level.

So, this base level basically is the point at which the channel goes and meet the other Trans stream or is for example, if you are having a tributary and tributaries base level will be the trance stream. So, if there is any fluctuation in the water level or in the trance stream, then there will be an incision or basically we can say that the channel will try to keep itself in equilibrium.

So, it will match it will try to match the level of the, the main trans steam and for example, the trans steam suppose it goes and finally ended its journey in an ocean or in a water body, then that will be the base level for the main trance stream. So, for example, if you take the major might or the mighty reverse in Himalayas which are departing into the end of Gangetic plains.

So, first base level is the indo gangetic plain but final were retained there its journey are their journey mainly the main majors drainage system for emerging from Himalayas like Ganga, Brahmaputra. The ocean they go and meet ocean hence we can say even the Indus also they could it goes and meet ocean. So, the ocean is the base level for this mighty reverse. So, if there is any fluctuation in the ocean or change in the sea level.

Then they will there will be a change in the base level in total, and they will be either in season or a grip or a gradation that means, either the river will degrade, erode or it will upgrade. So in terms of your high C level or if the base level is increasing, then there will be gradation, but if the base level goes down, then they will be incision in the they are joining or the channels which are joining the main body.

So, initiation occur as a result of change in the base level and the base level change could be due to change in sea level caused by tectonic uplift of subsidence. So, as I was talking about that, the one base level for all the reverse which are emerging from Himalaya the debouching

on the indo gangetic plain. The base level is Himalayan front because Himalayan front and other tectonic features in Himalayan front.

But the Himalayan front is the prominent distinct you morphic boundary, which is constantly you can say the tectonically uplifting because of the ongoing deformation between the Indian trade and the Eurasian trade. So, this uplift is continuously changing the base level and that will result into the formation of terraces due to incision. So, erosion due to tectonic uplift or subsistence can also result into change in base level.

Change in base level can also because of the discharge condition, there is low discharge relationship. So, if you are having excess amount of sediment supply, then also the base level will change. Now, classification of terraces basically are in general the terraces are erosional features erosional terrace is are those which are cut into the bedrock also termed as practices. So, please remember this that the erosional terraces.

Which have cut or which has which shows the incision in the bedrock along with the aluminium sitting on the top of it at also termed as practices and then we have the positional terraces are those cut in previously deposited illusion these are also been termed as Valley filled terraces. So, what happens is that you have the deposition which is taking place in the valley.

So, Valley has been filled and then it will be cut by the same channel. So, it is getting its own deposit resulting into a depositional terraces so terraces is going in Total the terraces are irrational features and if there is an reason cutting in the bedrock along with the alluvial then they are Top best practices they are irrational terrace or they are classified as an erosion Terraces, but the deposed terraces are those terraces.

Where there is the valley fuel deposits are in size by its own channel. So, first of the pollution and erosion by the same channel will result into the formation or we can classify such terraces as the position of terraces. So, we will see some examples of such terraces.

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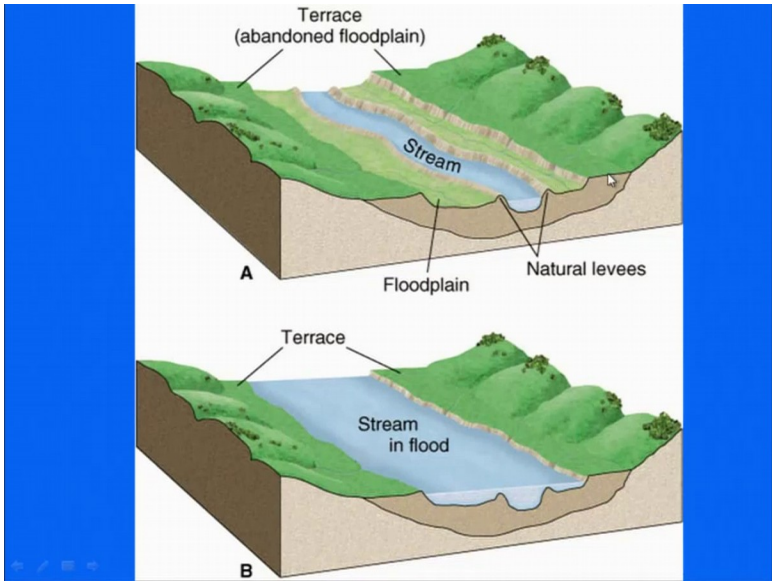

So, what we see in the upper A figure A is the some flat surfaces adjacent to the river valley or you can say that this white area is the river valley Which includes the land forms, step like land forms, which have been seen here. So if you see the profile, you see a step like feature here, there is a natural Levees, but this is also a part of terraces. So, terrace one and terrace two. And similarly, you see the terrace on the other side also.

Now, one important thing which we should remember that this are all the older flat event and older flat plains. So, this location people usually are in most of the areas people have been using such regions are the areas for construction or housing purposes as well as agriculture purposes. But these are the areas which are the abundant floodplains and can be occupied by this stream in frightening state.

So, if you peak floods. So, this whole area can be submerged. But one thing which you can remember that usually, the older terraces are the safe areas where the flooding will not usually effect at the low lying terraces close to the stream can be inundated by the flooding events. So, this area is close to the river even though they are terraces high higher sitting at the higher elevation should be avoided.

But, these are much higher which the older abundant floodplain. So, such areas are good for habitation.

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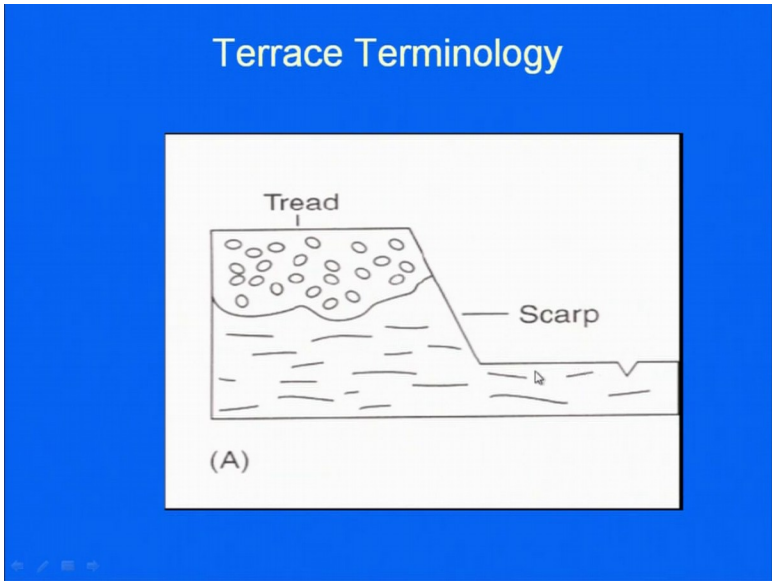

Now, terrace terminology basically is what we are talking about that it will Have a scar and threat or the step like feature and this fee type of step like feature or the terrace is mostly seen all along the river valley.

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This is an example from Himalayas a very small tributary, but of course, tributary of major river have incised tremendously the incision which you see here, this rocks the incline stratification of the rocks, these are all shivalix and old rocks in Himalayas, but compared to the in the in terms of the geological timescale. These are young rocks in Himalaya's sedimentary rock so sandstone scale and on the top here, you can see a boundary.

Which is comprised of Olivia. So, this material is all comprised of aluminium made up of gravel and sand, indicating the fluvial deposit deposited by River at this height. So this means

that as we were talking about so this forms a part of terrace and terrace is sitting, so high, the incision is almost like 70 to 80 meters. So, it has cut the aluminium as well as it has cut the rock bedrock.

So, please remember the previous slide that we are talking about if the terrace erosion terrace, which is formed, and all routine size, the aluminium as well as the bedrock. So, bedrock is also eroded as it is also termed as Strat terrace this an example of strat terrace.

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And other young terrace is close to the. So, this is not the picture of the same area, where the aluminium is at the top and then you are having the better organization.

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So, in other younger terraces are also seen in close to the river channel. So, you have again the sedimentary rocks. Older rocks are the bedrock and overlying. So, this is an again example of Strat terrace.

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Another one we are here,

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This is not bedrock. And on bedrock you see the olivine. So, these are all strapped terraces, which are indicative of an erosion which has taken place in Himalaya because of ongoing deformation. Now, terraces

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As we discuss in one of this slide, that these terraces which are located close to the deliver will are the areas prone to be or will be affected during flooding state. So, flood affected settlements on terraces in no through console this slides you have seen earlier also, but again the understanding of the terraces the land form to will land form most common who will land form.

If you see most of the houses and people have tendency to have to occupy this type of grey areas which are flat in nature. So, not much work need to be done. So, you will get a flat area and of course close to the river. So, this is one of the easiest way to have or maybe the Easiest way to get the land flatland close to the river. So, here if you see what we have is why there is one terrace here, smaller terrace.

And then you have other higher terrace and then for third one is over here, which is much higher three sets of terraces it is missing terrace, T zero is youngest T1 and this is T2 of this I was I discussed on that day that. Because of the undercutting of the banks of the terrace says this river this houses are at risk and they will they must have collapsed during the flood. **(Refer Slide Time: 15:48)**

And the other example.

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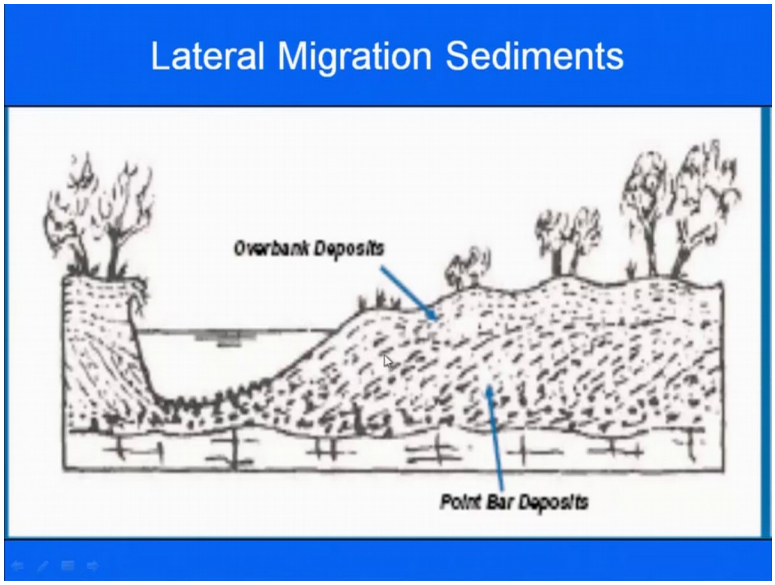

So, because of that people have tendency to have do construction or go for construction the flat area

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The risk is also associated with this. Now,

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Lateral migration is again and very common phenomena, which has been seen in the World Bank area and this lateral migration and we talked and have had some discussion, when we were talking about the point bar. So, you are having the inner side of the meandering fever and the outer side where the ocean is taking place. So, this the outer side the road erosion area shows a deeper profile.

So, this area basically critics have experienced a or experiencing erosion where this portion is showing that deposition and this will keep on migrating in this direction So, the erosion will shift here and the volition will have other. So, another we can say that the new bank which will upgrade, so, accommodation or movement of migration of this area along the then right

bank and the erosion along the left bank and this land form has been termed as point bar. So, irrational tourists or strategists

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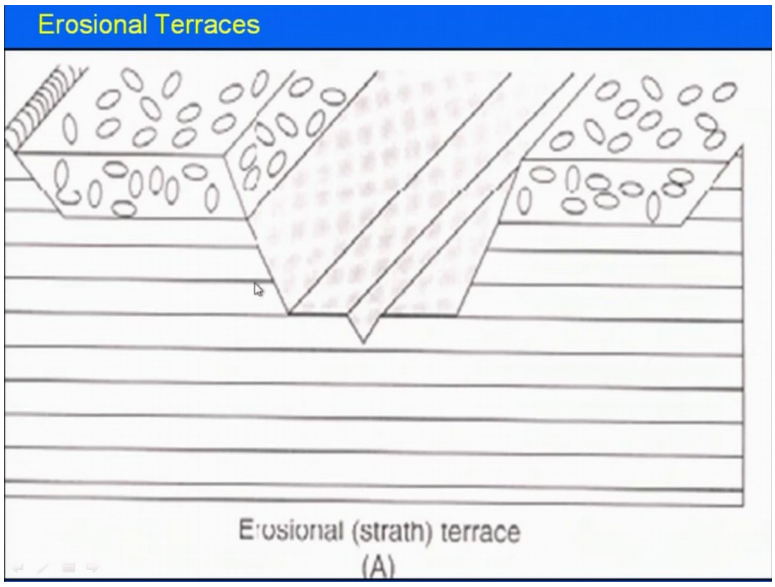

Where you have the alluvial as well as sensation of the bedrock. Another example

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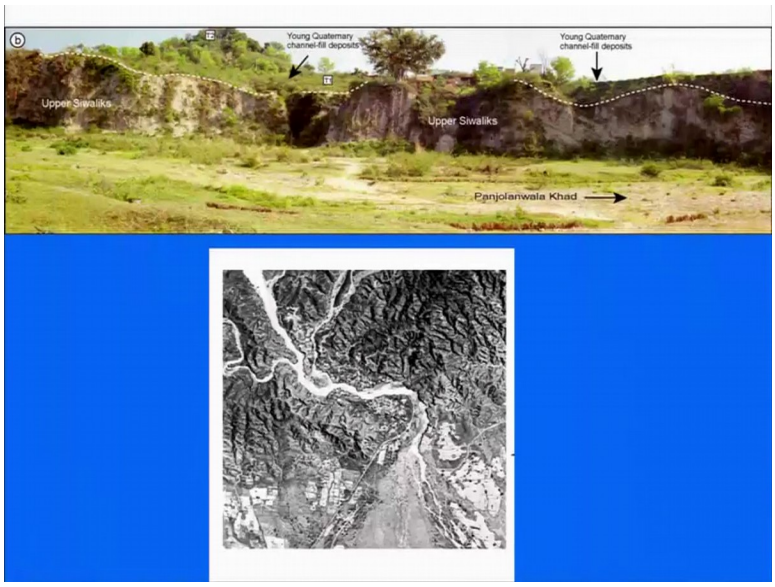

As I was talking about that most of the rivers which are flowing on the Indo gangetic plain will have the Strat terrace. This is an example of Strat terrace where you have the on the tops of this photograph has been taken over here and this is the front. So, you close to the front you have the erosion. Which is in an erected or cut through the alluvial as well as the backdrop here. Depositional is sitting over here on the side and there is the location of the terraces. Then the depositional terraces

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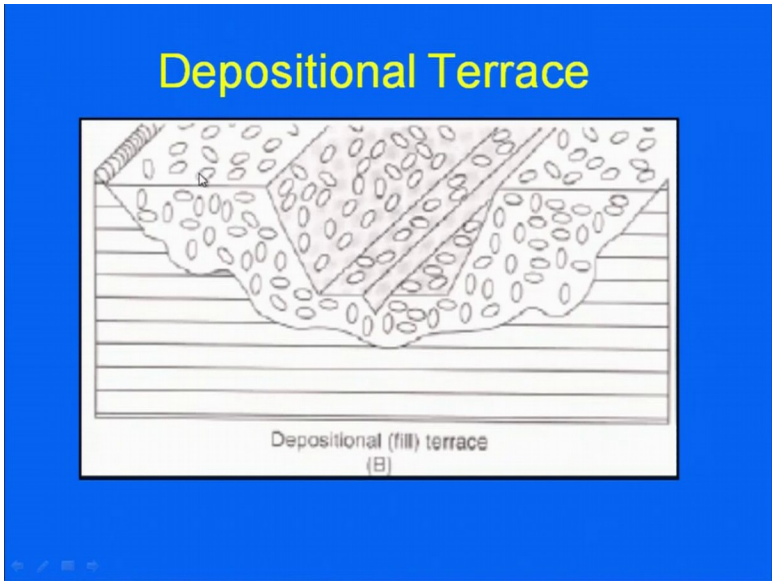

Where the aluminium itself has been cut down and which has resulted in the formation of flat step like features. So, these are the Depositional terraces. So land farm so the land forms which are associated with the fluid system.

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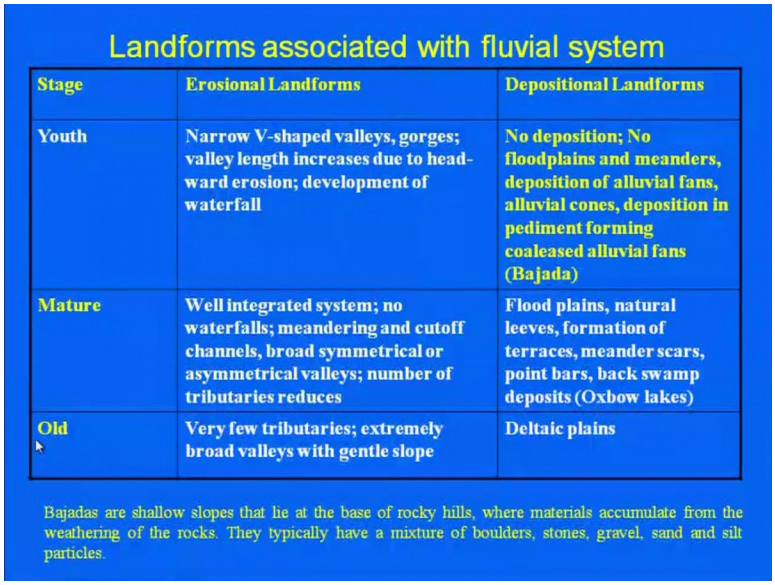

But most commonly what you will find is what we have discussed is the point bar, prayed bars and prayed bars or islands and terraces. Now if you look at what we were talking the beginning that we have different regions where through which they the river flow through and try to complete the journey right up to the from the source area up to the mouth. So, we have different stages.

Which we can talk one is your youth stage and other is mature stage and the old stage and the land forms which usually are been seen other than what we have discussed. If you go into the

hilly terrains you will mostly see the gorgeous so, those gorgeous are or we can say the narrow deep V shape valleys. So, those V shape valleys are indicative of youth state. So, the area is continuously rejuvenated.

And this rejuvenation all you can say the continuous erosion of the channel is because of the ongoing deformation. One thing which you will have to remember and this aspect of the few landscapers that if you are having suppose the V shape valleys, that is narrow valleys, they are indicative of very youth state and the reveal has not or reveal did not get enough time to erode laterally.

So, if there is a stabilize condition, where the base level is not changing, nothing is happening, the reveal will try to erode sideways and result into the formation or development of the wider valleys. So, wider in in terms of the width will be wider and then you will have the broad U shaped valleys. So, U shaped valleys are also both basically seen in glaciers where the glacier moves.

But U wider valleys basically can also be seen and most of the regions where you are having the lateral migration of the three, so, mature stage and the old stage. So, what are the land forms which are associated with this let us quickly look at So, one is the rotational land forms and other is that the partial land forms in different stages which are termed as the youth mature and old.

Let us see that. So, if you come down to this slide, then it shows that the erosional land forms in the youth state are narrow V shape Valleys gorgeous. Valley length increases due to head devotion so, this is what we were talking about that how the drainage basin is form. So, the headwind erosion will keep on taking place and the valley length or the drainage basin will keep on increasing it then occupying more areas.

More area in the upper reaches development of waterfall will also be seen, because, this will be the in the youthful state and in youth state, the positional land forms nor the portion will be seen because the erosion is continuously going on no floodplains and mentors. The position of a Louisville fan will be seen in the youth state because there will be a dumping at the mountain Fence alluvial cones.

The position and Piedmont forming resulting into the formation of coalesce alluvial fan and then this coil alluvial fan another term has been given as budget as now, this budget as are the ceil slopes that lies at the base of rock hills, where material accumulates from the weathering of rocks, they typically have mixture of Boulder stones, sand and said particles. So, these are basically are the shallow slopes that lies had the pace of rocky hills.

Now, coming to the another one is the mature stage, where again the erosional land forms which you will see will be well integrated system is been seen here, no waterfall, meandering and cut offs will be seen. So magistrate if you remember that the meandering and cut off channels and plot symmetrical or asymmetrical varies, number of triplicates reduces and this is seen in the similar like what we have.

We will looking at the river in the plane areas alluvial plane areas make me will resemble the mess mature straight an example best is the intensity play. So, what do you see is the mostly the floodplains naturally formation of terraces, me and the scars, point bars back swam deposits and oxbow lakes. So, oxbow lakes are related to your cut off channels. These are all the positional land forms as well as this are also termed as the ocean landforms.

For we will have meander scars which will result into the formation of pine bark on the other end and back swims where the oxbow lakes are. Then you have all state very few tributaries. Since the mature the tributaries, number of tributaries reduces whereas in the old stage, very future beauties extremely broad valleys and gentle slope. So extremely broad valleys means you have enough time.

All you have given enough time to the channel to the road and result into the formation of broad Valley. That means sideways migration. And the land forms which are related to this are basically the tectonic plates. So, they will take planes are the regions where you see the old stages of so, youth in the hill Terrance mature in the in the gangetic planes, for example. And this you can say for example, the Delta planes.

Like what we were looking at that is under one area, or the delta of Congo and Trump. So you can remember this and you can even clearly make out that this stage is when seen in the uplands in the middle part of the drainage and or the basin and the plane areas and at the hole

stage where the Steever goes and maybe that is the mouth or where the river and sets journey. Now again if you quickly look at the formation of the drainage base

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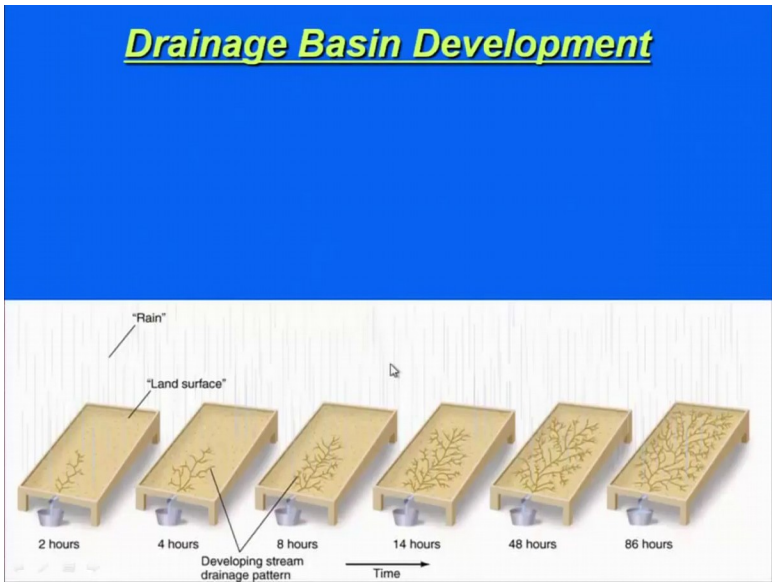

In one of the very good example,

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Which we saw in great run of catch where the uplifted region around the this is the fault here unbent fault where this a this Northern part from this boundary, this part is up and this part is down in greater enough catch and what we see is the formation of the small terraces this on very small scale. But the similar phenomena occurs on the larger scale, but we have seen the mighty reverse.

So, the drainage keeps on adding up and the length increases. So, the headwater ocean is taking land and then some places what happens is that they this channel, where the drainage keep on extending on the side may breach into the train is divided of the adjacent drainage basin and it will capture. And then flow will be coming to all tributaries will contribute to this river basin.

So, these are beautiful example of showing the of the smaller Dennis basins contributing to the main trunk steam. And here if you see what we were talking about that for example, for this channel here, these are all sub basins and finally, this are these are also some basins which are contributing to this channel. And then meeting the Transiting and this will be the base level for this channel.

If the base level changes and since there is no change in the gradient here, there is geo morphing divide this portion has resulted in the formation of smaller deltas. Now,

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Just to show you that the water flowing on the floor can carve the landscape as we experienced on this slope here. So, this is the photograph from Neil Island in Andaman Nicobar Islands King, where the water was coming during the high tide and flowing back resulted into an ocean. And it so happened that we were able to photograph and see some permission of the land forms on a very miniature scale.

So, if you see the close up here of this area, and you will understand that what we will we came across. Yeah. So this one,

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So, again, the divide in slope and slope here. So steeper slope and river is in sizing so and the distributed network formation of delta and the braid bars over here in the center. And we are here what we see is the meander along the major channel and this man that on this side has resulted into the formation of the devotional terraces and what so point bar but got into size because of the change in the base level three.

So, close above this and similarly, at some locations what you see are all the highlands here of the distributor network or the braided channel. Close up of this,

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You see there are terraces number of multiple terraces or form. So, you can easily count one, two, and then finally, this is the top surface third one. So, multiple tourists here we are the

main two has taken place and the major terrace has been seen here. There is older terrace over here and the younger terrace happens in here. So, based on that

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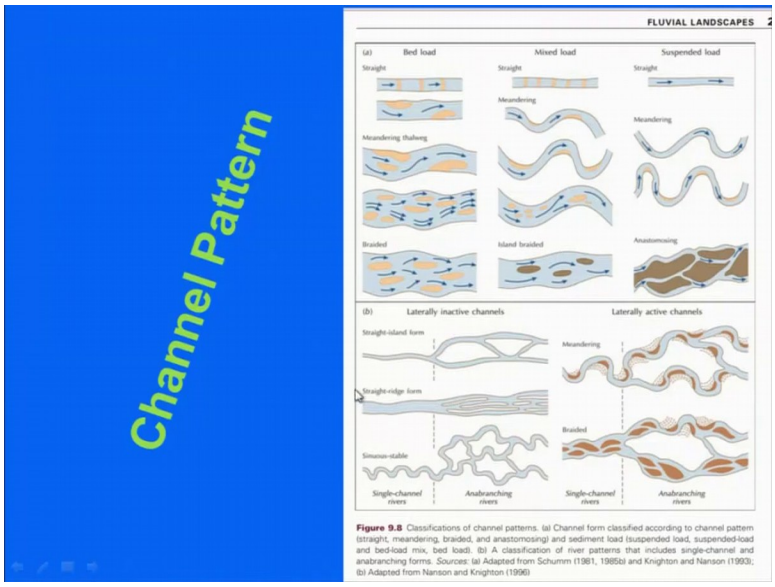

One can easily make out the formation of different terraces or different land forms at different stages. So, I will stop here and we will continue in the next lecture, talking about the channel patterns and how the channel patterns are been controlled by a given again this slope and so, the gradient plays an important role in in different channel patterns as compared to what we were talking about when for the drainage patterns also.

So, drainage pattern will talk later but right now, without the channel patterns so, this lecture we talked about mostly the land forms in youth, mature and old states. Thank you so much.